

Computer program

- * A collection of ~~just~~ instructions to a computer to perform some task or handle data.
- * It is an implementation of an algorithm with a computer programming language.
- * programs are written to handle data.

Data

- * denotes a single value set or group of values
- * Have many forms such as, text, number, image

Data Structure

Data structure is a way to store & organize data efficiently.

They provide both space efficiency & time efficiency in arranging the data.

When learning Java, you have already used one of the data structures, Arrays.

Arrays is a collection of data elements where data is stored sequentially (one after the other) in the memory.

Advantages of Data Structures

* Efficiency

* The use of data structures make a program to work efficiently in term of time & space

* Reusability - A same data structure can be used.

* Abstraction - Internal logic of a data structure can be hidden from the end user.

Types of Data Structures.

Has two types

- 1) primitive data structure
- 2) Non-primitive data structure.

primitive Data Structure.

* Data structures which are supported at the machine level.

* Consist of primitive data types like, Int, char, float, double & pointer.

They holds a single value.

```
int num = 4;  
char ch = 'a';  
float f = 3.14;
```


Non-primitive Data Structure.

(3002)

They too provided by the languages
But cannot be formed using the primitive data
structures.

Used to store large & connected data.

Eg:- Arrays, Lists, Queues.

Has two types

- 1) Linear data structure
- 2) Non-linear data structure.

Linear data structure

* The data is arranged in a sequential manner.

Ex:- Arrays

Linked list

Stacks

Queues.

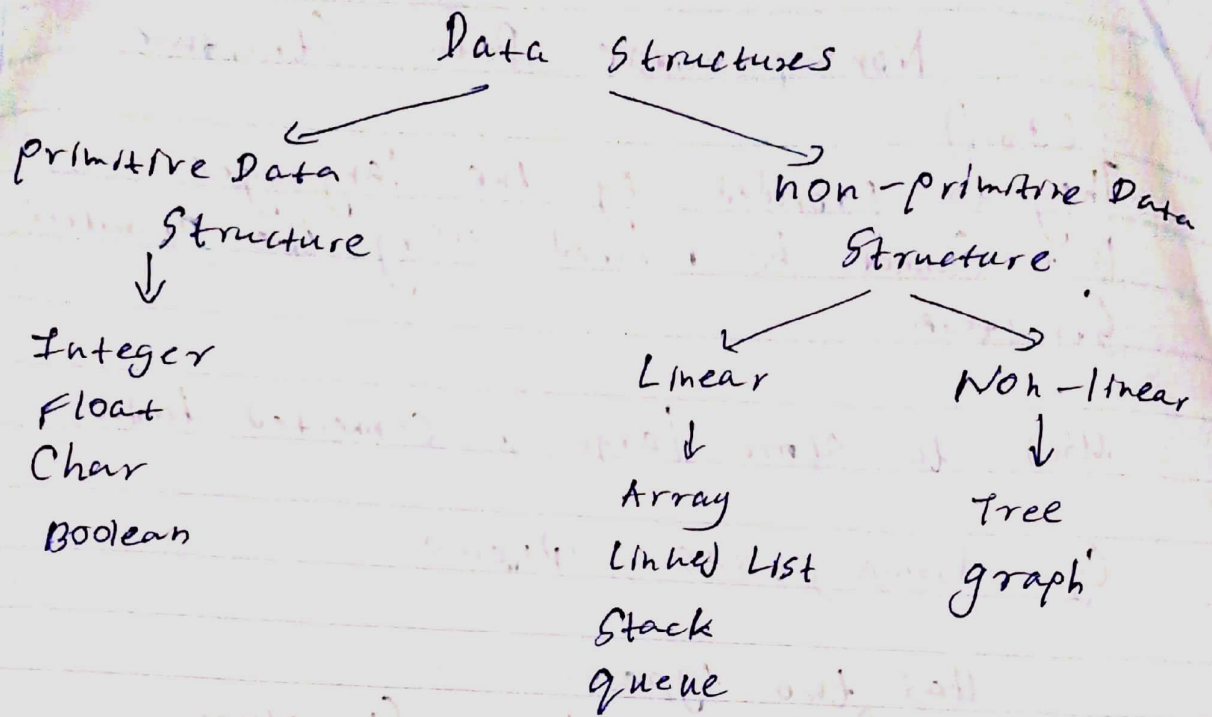
* Here one element is connected to only one another element in a linear form.

Non Linear data structure.

* One element is connected to 'n' number of elements.

Ex:- Trees

Graphs



Abstract Data Types (ADT)

- * ADT is a mathematical model for data structures.
- * They define the behaviour of data structures by a set of values and a set of operations in an abstract way.
- * They hide the implementation logic of a data structure.
- * describing what operations are to be performed but not how these operations will be implemented.

Different types of ADT

- * List ADT
- * Stack ADT
- * Queue ADT

Array Data Structure.

* An array is a collection of fixed number of components

* all the data elements have the same data type.

There can be

1) One-dimensional arrays - Components are arranged in list form

2) Multi-dimensional arrays - Components are arranged in tabular form.

Array Data Type

Properties

- * Index value
- * Data value

Operations.

- * Insertion
- * Deletion
- * update.

`int marks[] = new int[6];`

65	53	98	35	76	44
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`int lengths[][] = new int[3][4]`

12	24	53	44
45	56	17	86
59	10	51	82

2 Rows.

Columns

`int data[][][] = new int[4][3][3]`

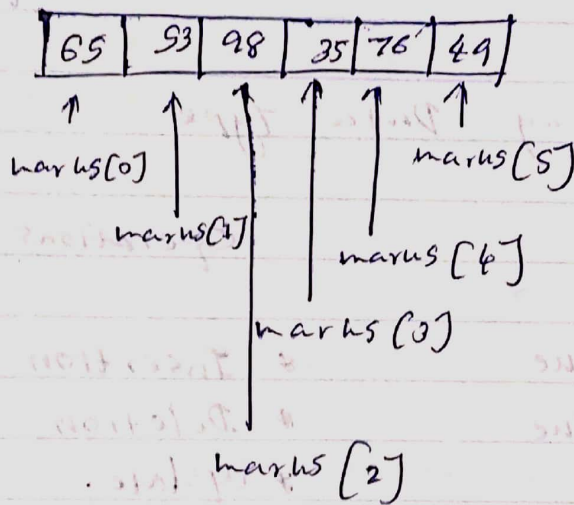
BASICS OF Arrays.

* An array consists of collection of sequential memory locations that have the same type.

* The collection of data in an array is indexed & the index starts with 0.

* Index is called as the subscript as well.

`int marks[] = new int[6];`



Algorithm

* finite set of instructions or logic that are written in order to carry out a certain predefined task.

* Used for data manipulation operations like sorting & searching inside these data structures.

* Can be expressed as an informal high level description as pseudocode or using a flowchart.